Service Manual

KANMED® BABYWARMER

Part no: BW-50-079 / 5B

CE 0413

Modifications

Any modifications on the control unit, control unit electronics, heating pad, water mattress and baby nest will void KANMED's responsibilities totally and are not allowed without the written consent of KANMED.

Caution

Please read this manual carefully. Incorrect use and service of patient warming equipment may cause serious patient injury.

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2005-03-24

1 INTRODUCTION

For a general description of the KANMED Baby Warmer and how to verify that it is functioning properly we refer to the user manual. In case you do not have one it can be downloaded from internet in several languages. Se www.KANMED.se
This service manual describes the basic functions of the KANMED Baby Warmer and how do determine faults and do smaller repairs.

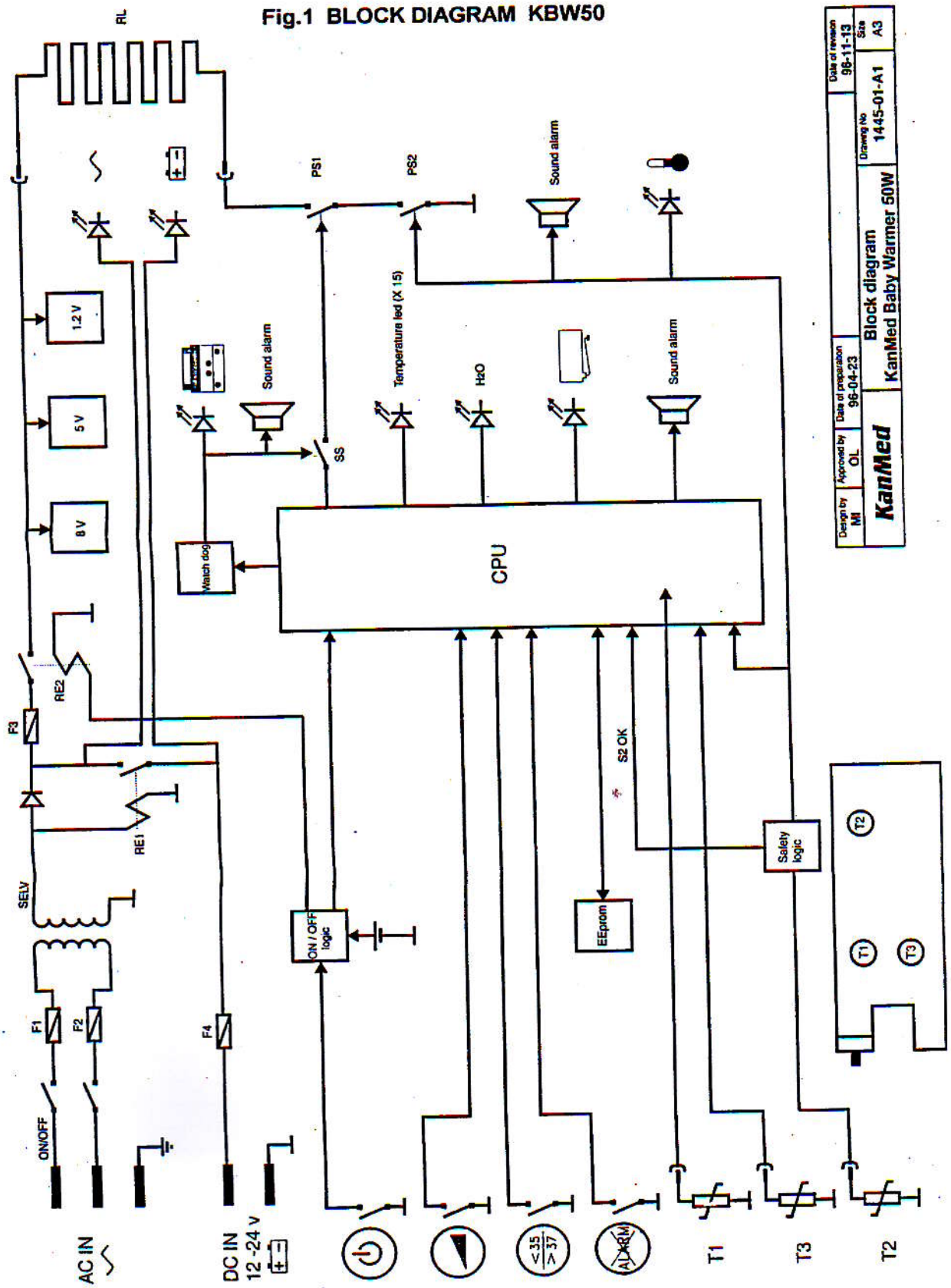
KANMED's service policy states that only properly trained distributor technicians and qualified Hospital technicians may carry our repairs on the main PCB.
Instead we ask you to make full use of our PCB exchange program because this ensures the delivery of a tested and calibrated replacement PCB with 3 months warranty.

2 PRINCIPLE OF OPERATION

See also diagram page 3 and 9

The KANMED Baby Warmer is an electrically heated and precision controlled water bed for infants.
It consists of a control unit and a heating pad, which is inserted, into a pocket in the water mattress.
The heating power to the heating pad is supplied by the control unit, via power switches PS1 and PS2.
The heating pad contains the heating element RL and thermistors T1, T2 and T3.
T1 and T2 sense the temperature of the water in the mattress while T3 senses the temperature of the heating element in the pad.
Using the information about element temperature supplied by T3, the CPU controls PS1 to limit the element temperature to about 43°C as long as the actual water temperature is lower than the selected temperature.
Via T1 the CPU monitors the temperature of the water in the mattress and when the set temperature is reached, the CPU controls PS1 to keep the water temperature at the set value.
T2 controls PS2 independent from the CPU and if for some reason the temperature of the water exceeds 39°C, T2 will switch off PS2 and stop the heating altogether and also activate the beeper and the over temp - LED.
The watchdog monitors CPU operation and in case of a CPU failure switches off heating via the safety switch SS and also activates the beeper and the electronic failure - LED.
The EEPROM is used to store calibration values for T1 and T3 input circuits.
The supply voltage to the control unit can either be mains voltage 115 / 230 V AC or DC voltage 12 - 24 V from a battery.
Both supply voltages can be connected simultaneously but the first choice of the unit will always be the mains supply. If the main disappears, is switched off by the ON/OFF switch or is not present at start up, RE1 will close and connect the DC supply to unit.
At each start of the warming, the CPU issues a test signal to the "safety logic" and all safety circuits are tested during the so called self test. Only if all tests are successfully completed can the CPU continue to operate and start the warming.

Fig.1 BLOCK DIAGRAM KBW50



3 SPARE PARTS AND EXCHANGE UNITS

3.1 SPARE PARTS POLICY

KANMED keeps and supplies spare parts considered necessary to keep a good service level. These are to be found in the spare part list.

WARNING: Certain components must not be replaced unless you have the possibility of carrying out a calibration of the unit. Study section 5.2 REPAIRING carefully before carrying out any PCB repairs.

3.2 EXCHANGE POLICY

To simplify repair procedures and keep repair time low, KANMED runs an exchange service for the Main- and Front PCB of the KBW50.

Exchange part No.	Designation
700-0234-EU	Main PCB KBW50 , Exch. Unit
700-0235-EU	Front PCB KBW50, Exch. Unit

Exchange Units will be supplied at a fixed price (marked: "repair price" on the spare parts price list. This price is equivalent to the estimated average repair cost) independent of the type of fault if the returned faulty PCB is found to be repairable.

For returned faulty PCBs which are found not to be repairable, we offer you to buy an Exchange Unit at a special price (marked "selling price" on the spare parts price list).

For returned PCB's which are cannibalised, an extra charge to cover the cost of the missing components will be added to the Exchange Price.

3.3 SPARE PART LIST (SPL)

Part.No	Designation	No/ pack
700-0267	Bottom plate	1
700-0234	Main PCB KBW50	1
700-0234EU	Main PCB KBW50 (repair price)	1
700-0234EU	Main PCB KBW 50 (sell price)	1
700-0280	Housing KBW50	1
700-0324	Fuse T3.15A	10
700-0282	PROM KBW50	1
700-0260	Ground cable assy. KBW50	1
700-0259	Ground cable KBW50	1
700-0269	Battery LR6, alkaline	1
700-0233	Fuse holder	1
700-0001	Fuse T1A L250V	10
700-0079	Fuse T 2A L250V	10
700-0232	Mains inlet and filter	1
700-0244	Potential equalisation stud	1
700-0279	Rear panel KBW50 with label	1
700-0271	Cable assy. 7-pool KBW50	1
700-0268	Handle	1
700-0235	Front PCB KBW50	1
700-0264	Front panel KBW50, with label	1
700-0272	Cable assy.3-pol KBW50	1
700-0230	Edge cover	1
700-0253	Lighter Plug	1
700-0274	3pole DIN plug (battery cable)	1
700-0255	Elastoseal	1
700-0459	Capacitor 22uF, 50V 105°C	5
700-0231	Transformer	1
BW-50-07x	User manuals can be downloaded from internet	

4 DISMANTLING AND REASSEMBLING PROCEDURES

WARNING: Always disconnect the mains cable before opening the instrument.
CAUTION: Work only on properly grounded static free working stations following ESD rules.

The following procedures are described below :
4.1 BOTTOM PLATE
4.2 RUBBER EDGE COVERS
4.3 MAIN PCB
4.4 FRONT / REAR PANEL
4.5 FRONT PCB
4.6 HANDLE

4.1 BOTTOM PLATE

- Place the instrument upside down
- Remove the 6 screws
- Slide the bottom plate towards the front panel until it comes free from the rear edge cover and then lift off the bottom plate and disconnect the ground wire. Don't forget to reconnect the ground wire or it may cause short cuts.

4.2 RUBBER EDGE COVERS

Edge covers are only removed if you have to exchange front or rear panels.

Edge covers are glued (ELASTOSEAL A07, se SPL) to the housing **but not to** the bottom plate.

1 Break the bonding of the glue from the 3 sides of the housing by applying force and if nessecary cut with a thin blade without damaging the painting. Sometimes it will be nessecary to replace the runner edge.

2 Grip the edge cover in a corner and lift it a few mm to free the inside groove of the cover from the protruding part of the front oe rear panel and pull the cover from the housing

REMOUNTING: Apply a thin layer of ELASTOSEAL A07 on that part of the housing that will be covered by the edge cover before mounting the edge cover,

4.3 MAIN PCB

1. Dismount the bottom plate
2. Disconnect connectors P1, P4, P5 and P6 (se page 12). NOTE: When disconnecting / connecting P1, support the PCB in order to avoid heavy bending which will damage components.
3. Remove the 4 pcs PCB-mounting screws
4. Grip the PCB by the battery holder and relays and pull the PCB towards the rear panel until sockets J7/8 come free from pins P7/8 on the front panel and then lift the PCB out from the housing

4.4 FRONT AND REAR PANEL

1. Dismount the edge cover according to procedure 4.2
2. Disconnect the panel to be removed from the Main PCB
3. Remove the 4 screws that fit the panel to the housing and then pull off the panel from the housing and disconnect the ground wire

4.5 FRONT PCB

1. Remove the front panel according to procedure 4.4
2. Remove the 2 nuts and then pull off the PCB from the panel

4.6 HANDLE

Thread a screwdriver (Phillips) through the hole in the handle and unscrew the screws
NOTE: If for some reason the handle is not remounted, the mounting holes for screws must be fitted with M5 screws (max. length 25 mm) to prevent liquid from entering the unit

5 REPAIRING,

5.1 GENERAL

Trouble shooting and repairing should only be carried out by experienced electronic engineers using proper tools and test equipment and with reference to descriptions and circuit diagrams provided in this manual. See point 6 about temperature measurement

We recommend to use our EXCHANGE PCB SERVICE

5.2 WARNINGS AND CAUTIONS

WARNING Whenever voltage regulator N7, operational amplifier N4, connector P1 and associated components are replaced or re-soldered, the KBW50 has to be calibrated according to section 7. Only KANMED can do this.

WARNING When operating the KBW50 with the bottom plate removed, AC voltage higher than 300 V will be exposed. Take precautions to avoid electrical shocks.

WARNING Even after disconnecting Mains Power from the unit, capacitors may still carry voltages. Take care to avoid electrical shocks.

CAUTION The KBW50 contains static sensitive CMOS devices which may be damaged by improper handling. Do not handle except on properly grounded static free working stations. Handle all Printed Circuit Boards (PCB) by their edges, do not touch any parts unnecessarily.

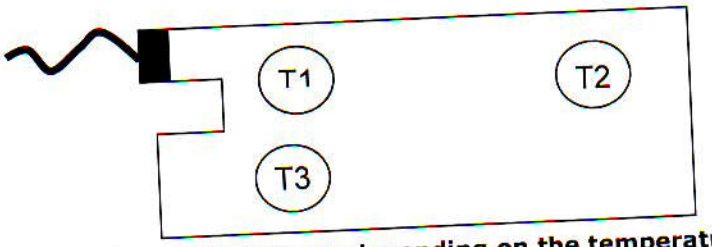
CAUTION All PCB's sent back for repair or exchange **must** be properly packed in conductive packing material or they will not be repaired!!

6 TEMPERATURE MEASURING

Equipment needed : Precision thermometer with skin sensor
A foam mattress about 50 mm thick
Standard hospital baby blanket

1. Place the heating pad in the pocket of the water mattress and put it on the foam mattress
2. Tape the skin sensor ***on the top centre*** **of the water mattress** and cover with the blanket. There must be water and no air bubbles in the water mattress. (Make sure there is very good contact between the sensor and the water mattress to avoid false readings)
3. Start the heating with and note the temperature of the water mattress about 10 min ***after*** the set temperature has been reached
4. **The recorded temperature should be "set temperature" +/- 0.5°C**

T1 Regulating and measuring of water temperature
T2 Over temperature alarm (water temperature > 39,5 ± 0,5°C)
T3 Element temperature limitation, 43 °C



Note: The T1, T2 and T3 values indicated are depending on the temperature of the Heating Pad. To obtain absolute true R-values the Heating Pad has to be kept at a known temperature, like in a water bath.

Temperature °C	KΩ	Temperature °C	KΩ	Temperature °C	KΩ
20	12,492	28	8,7774	36	6,2675
21	11,942	29	8,4083	37	6,0155
22	11,419	30	8,0568	38	5,7751
23	10,922	31	7,7218	39	5,5456
24	10,450	32	7,4026	40	5,3264
25	10,000	33	7,0983	41	5,1170
26	9,5722	34	6,8082	42	4,9170
27	9,1650	35	6,5314		

7 SOFTWARE INFORMATION

The KBW50 operating program is stored in the 256k PROM D8 which is mounted on a socket on the Mains PCB. PROM versions of the KBW50 are designated Vx.xx were x.xx is the version number.
PROM version indication takes place at every start up at the end of the self test. The actual indication consists of 5 flickering of a temp-LED as follows:

Flickering temp-LED	PROM version
25	1.02
30	1.03
34	1.04

Software History

Up to now the following Software Versions exist:

Sw. version	Issued	Features	Compatibility
V1.02	96 35	1 : production series	
V1.03	96 47	Incorporates T1 / T3 testing Replaces all V1.02 PROMs Accepts new Calibration box Senses 12/24 V external battery	
V1.04	98 39	Improved safety	replaces all V1,02 and V1.03

8. Wiring Diagram

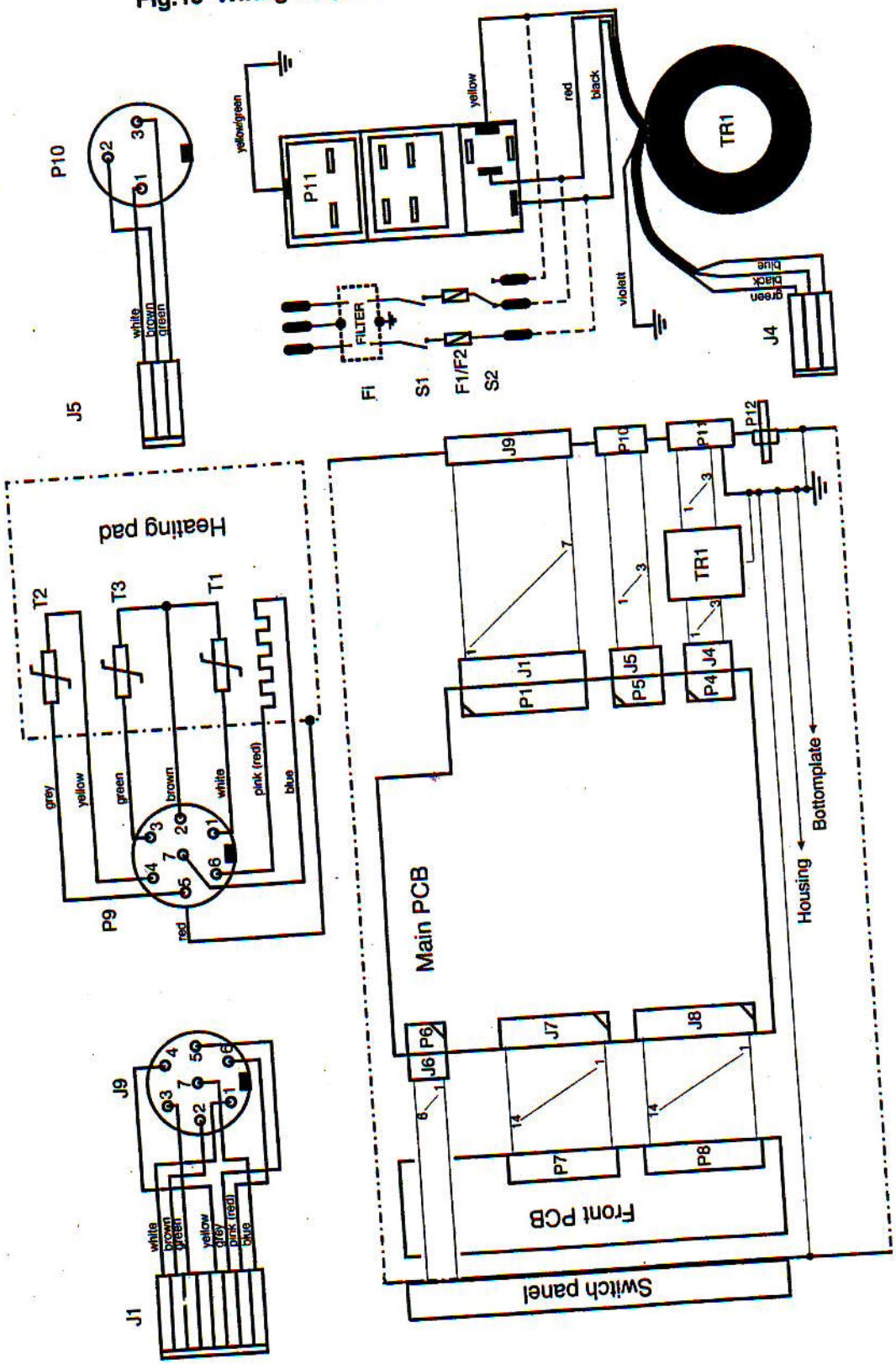



Fig.13 Wiring diagram